

CLAIMS

What is claimed is:

- 5 1. A portable hemming apparatus for edge hemming nested metal panels, said hemming apparatus comprising:
- a support structure;
- a plurality of modular self-contained
- 10 hemmers disposed about said support structure, each said hemmer being cooperatively operable to effect a hem in nested metal panels;
- a corresponding plurality of hemmer operators operatively connected to said modular
- 15 hemmers; and
- at least one drive mounted on said support structure drivingly connected with said operators to move said operators whereby actuation of said drive causes each self-contained hemmer to hem an edge
- 20 portion of said nested metal panels.
2. The portable hemming apparatus of claim 1, wherein each self-contained hemmer includes a hem die, a hem die holder supporting said hem die and a
- 25 hem punch.
3. The portable hemming apparatus of claim 1, wherein each said operator comprises a lever arm assembly.
- 30 4. The portable hemming apparatus of claim 1, wherein said drive is pneumatic.

5. The portable hemming apparatus of claim 4, wherein said pneumatic drive is an air spring.

5 6. The portable hemming apparatus of claim 1, wherein said support structure is adapted to be mounted to a robot arm.

7. The portable hemming apparatus of claim 10 1, wherein said support structure is adapted to be hung from a tool balancer.

8. The portable hemming apparatus of claim 1, wherein the support structure is adapted to be 15 mounted on a pedestal stand.

9. A portable hemming apparatus for edge hemming nested metal panels, said hemming apparatus comprising:

20 a support structure;
a plurality of modular hem die holders attached to said support structure;
a corresponding plurality of modular hem dies mounted to said modular hem die holders;
25 a corresponding plurality of hem punches;
a corresponding plurality of operators operatively connected to said hem punches;
said operators being generally elongated and having a first end connected to said hem punches
30 and a second end having a moveable engagement member;

a roller plate having a flat outer portion supporting said moveable engagement members and a raised, cylindrical, hollow inner portion;

5 a roller plate cap mounted to the outer wall of the raised, cylindrical, hollow inner portion of the roller plate at a distance above the flat outer portion of the roller plate;

a first air spring drive attached to the support structure on its bottom end and to the roller
10 plate on its top end;

a stop plate;

a second, smaller air spring drive located within the raised, cylindrical, hollow inner portion of the roller plate and attached on its outer end to
15 the stop plate; and

the stop plate being attached to the top of the hem die holders;

whereby the hem punches are movable via the operators through actuation of the air springs.

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10. The portable hemming apparatus as in claim 9, wherein each operator comprises a lever arm and assembly.

25 11. The portable hemming apparatus of claim 9, wherein the support structure is adapted to be mounted to a robot arm.

30 12. The portable hemming apparatus of claim 9, wherein the support structure is adapted to be hung from a tool balancer.

13. The portable hemming apparatus of claim 9, wherein the support structure is adapted to be mounted on a pedestal stand.

- 5 14. A method of edge hemming a nested metal panel with a hemming apparatus comprising the steps of:
- mounting the hemming apparatus to the end of a robot arm;
- 10 , moving the robot arm so that the hemming apparatus approaches the metal panel;
- rotating the hemming apparatus so that the pre-hem die set of the hemming apparatus is oriented towards the portion of the metal panel to be hemmed;
- 15 moving the robot arm so that the hemming apparatus is in a working position with respect to the portion of the metal panel to be hemmed;
- cycling the hemming apparatus to complete the pre-hem operation;
- 20 moving the robot arm so that the hemming apparatus is in a clearance position with respect to the metal panel;
- rotating the hemming apparatus so that the final hem die set is oriented towards the portion of
- 25 the metal panel to be hemmed;
- moving the robot arm so that the hemming apparatus is in a working position with respect to the portion of the metal panel to be hemmed;
- cycling the hemming apparatus to complete
- 30 the final hem operation; and
- moving the robot arm away from the metal panel.

15. A method of edge hemming a nested metal panel with a hemming apparatus comprising the steps of:

5 mounting the hemming apparatus on a pedestal stand;

securing the metal panel to a robot arm via a gripper;

10 moving the robot arm so that the portion of the metal panel to be hemmed is in a working position with respect to the pre-hem die set;

cycling the hemming apparatus to complete the pre-hem operation;

15 moving the robot arm so that the metal panel is in a clearance position with respect to the hemming apparatus;

moving the robot arm so that the portion of the metal panel to be hemmed is in a working position with respect to the final hem die set;

20 cycling the hemming apparatus to complete the final hem operation; and

moving the robot arm away from the hemming apparatus.